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250. ON THE MIOCENE PECTINIDAE FROM THE ENVIRONS
OF SENDAI. PART 6; A NEW PECTINID FROM THE
MONIWA FORMATION*

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仙台附近中新統産 Pectinidae, その 6. (茂庭層産帆立貝の一新種); 茂庭層から採集した *Patinopecten* の新種を記載した。最初に数個の標本を筆者に提供してくれた東北大学理学部地質古生物学教室学生中島浩三君の名をとつて *Patinopecten nakajimai* MASUDA と命名した。

増田孝一郎

During his geological studies in the southern border of Sendai City, Mr. Kôzô NAKAJIMA, student of the Institute of Geology and Paleontology, Tohoku University, collected an interesting scallop from the granule conglomerate of the Moniwa formation. This fossil was turned over to the writer for examination, and as a result of study, it was found to represent a new species, for which further material became necessary. Accordingly, the writer and Mr. NAKAJIMA revisited the locality and collected additional material. For this interesting scallop which was collected from the granule conglomerate of the Moniwa formation at Kita-Akaishi, Oidemura, Natori-gun, Miyagi Prefecture, a new name is proposed in this article.

Acknowledgements are due to Dr. Kotori HATAI of the Department of Geology, College of Education, Tohoku University, for supervising the present work. Thanks are also due to Mr. Kôzô NAKAJIMA for his kind offer of the specimens which he collected.

Family Pectinidae

Subfamily Pectininae

Genus *Patinopecten* DALL, 1898

Patinopecten nakajimai MASUDA, n. sp.

Plate 21, figures 1a-b, 2a-b, 3a-b, 4 & 5.

Shell large, rather thick, orbicular, equilateral except for auricles, a little higher than long; the right valve being more convex than the left; both valves radiately ribbed and forming an angle of about 100° at apex.

Right valve with about 40, low, round-topped, close-set radial threads and fine concentric growth lines; the radials are wider than their interspaces in breadth at upper half of disc and nearly equal at the lower half, and usually tend to separate into two or three riblets at the upper half of the disc. The rib-bifurcation in the anterior and posterior areas are more conspicuous than in the central area of the valve.

Left valve with about 40, distinct radial threads and fine concentric growth

* Read Oct. 10, 1953; received Oct. 14, 1953.

lines, and very rarely with faint intercalary threads between the radials; the interspaces are much wider than the radials and ornamented with fine network. Auricles of right valve subequal in size, though the anterior is a little larger than the posterior; anterior furnished with a wide and shallow byssal notch; ornamented with concentric lines and radial threads. Anterior auricle in left valve a little larger than posterior and sculptured with imbricated radials and concentric lines, the sculpture being similar to that of the posterior. Hinge of right valve with distinct cardinal crura, and wide and shallow resilial pit provided with lateral ridges and with no ctenolium. Left valve with hinge provided with sockets which correspond to lateral ridges of resilial pit of right valve and with cardinal crura. Internal surface of both valves smooth.

Dimensions (in mm):—

Valve	Right*	Right	Right	Left	Left	Left
Height	110	120	75	115	105	75
Length	105	115	70	112	110	67
Hinge-length	48	—	—	48	50	32
Depth (convexity)	16	17	10	10	10	7
Apical angle	100°	100°	100°	100°	100°	95°

*Holotype specimen.

Type locality and horizon:—River cliff of Natori-gawa near the Akiu Car-line Station at Kita-Akaishi, Oide-mura, Natori-gun, Miyagi Prefecture. Lat. 38° 13' N., Long. 140° 45' E. Moniwa formation. Early Miocene.

Depository:—Reg. No. 1063; Department of Geology, College of Education, Tohoku University.

Remarks:—This species is characterized by its rather thick, large, compressed

shell which is provided with about 40 low, close-set, bi- or trifurcating radial threads in the right valve and by the left valve in having radial threads much narrower than the interspaces, and by its being less convex than the right.

Patinopecten yamasakii (YOKOYAMA) resembles the present species in having bi- or trifurcate radial threads, but is distinguished therefrom by the less number of radial threads, which are low and faint.

Placopecten akihoensis (MATSUMOTO) also resembles the present species in having an orbicular shell and very similar cardinal crura, faint radial threads, wide and shallow byssal notch in the right valve and by possessing about 40 undichotomized radial threads on the left valve. However, MATSUMOTO's species can be distinguished from the present one by the less convexity of the valves, much fainter radial threads, radials narrower than the interspaces, lacking radial threads on the young species of the right valve, by the occasional intercalaries on the left valve, by the radials being about equal to or slightly narrower than their interspaces and by the regularity of the radials.

This species is rather rare in the Moniwa formation and is known only from the type locality and Ainosawa, a small valley extending northwards about 500 m northeast of the Kita-Akaishi Car-line station in Oide-mura, Natori-gun, Miyagi Prefecture.

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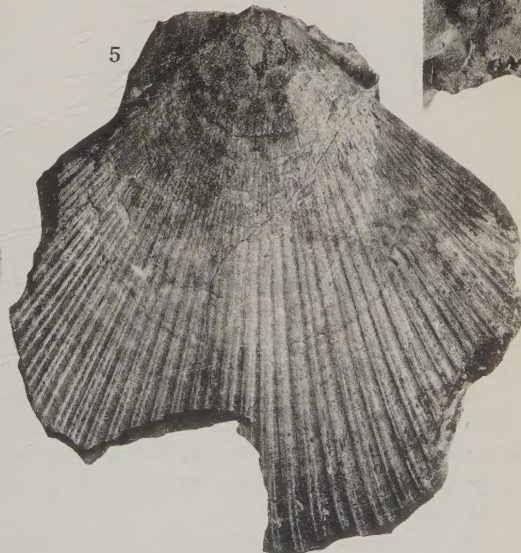
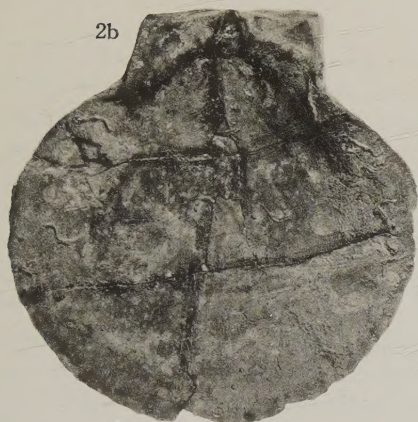
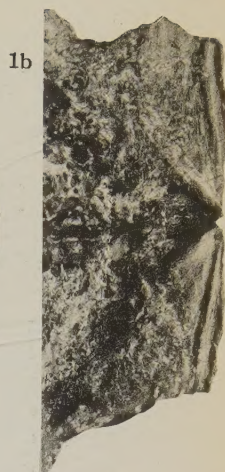
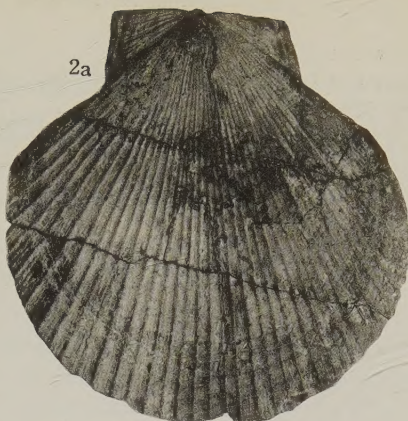
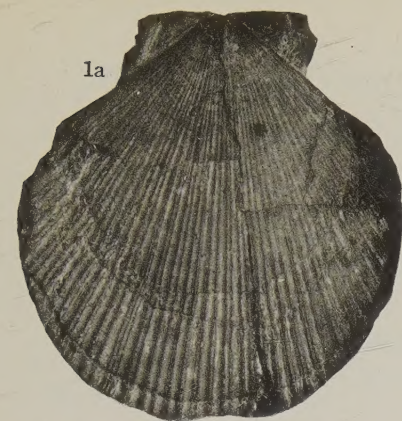
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Explanation of Plate 21

- Figs. 1a-b, *Patinopecten nakajimai* MASUDA, n. sp. Holotype, Reg. No. 1063. a. Right valve, $\times 1/2$, b. Hinge area of 1a, $\times 1$, Loc. River cliff of Natori-gawa near the Akiu Car-line Station at Kita-Akaishi, Oide-mura, Natori-gun, Miyagi Prefecture.
- Figs. 2a-b, *Patinopecten nakajimai* MASUDA, n. sp. Paratype, a. Left valve, $\times 1/2$, b. Internal view of 2a, $\times 1/2$. Loc. Same as above.
- Figs. 3a-b, *Patinopecten nakajimai* MASUDA, n. sp. Paratype. a. Left valve, $\times 1/2$, b. Hinge area of 3a, $\times 1$. Loc. Ainosawa, a small valley extending northwards about 500 m. northeast of Kita-Akaishi Car-line Station in Oide-mura, Natori-gun, Miyagi Prefecture.
- Fig. 4, *Patinopecten nakajimai* MASUDA, n. sp. Paratype, Right valve, $\times 1/2$. Loc. River cliff of Natori-gawa near the Akiu Car-line Station at Kita-Akaishi, Oide-mura, Natori-gun, Miyagi Prefecture.
- Fig. 5, *Patinopecten nakajimai* MASUDA, n. sp. Paratype, Right valve, $\times 1$. Loc. Same as above.





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251. *OINOMIKADOINA OGIENSIS*, N. GEN., N. SP., FROM
THE PLIOCENE OF NIIGATA, JAPAN*

TAKASHI MATSUNAGA

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新潟県鮮新世の新属・新種 *Oinomikadoina ogiensis*: 新潟県刈羽郡西越村小木の上部灰爪層から産出した *Oinomikadoina ogiensis* n. gen., n. sp. を記載した。此の新属は Anomalinidae の Cibicidinae に属し、外形は *Cibicides* に似ているが、supplementary aperture を有する点で、後者と区別される。

松 永 孝

Introduction—In the summer of 1950, when the writer was conducting investigations for petroleum exploration at the Betsuyama oil field¹⁾ of Teikoku Oil Co., he collected many fossil foraminifera from the Tertiary formations. The results of biostratigraphic research on these faunal assemblages were reported²⁾ to the Exploration Department of the company in February, 1951. In September 1953, a detailed study of the foraminifera from this area resulted in the finding of the new form described below.

Acknowledgements—In the present study, I am much indebted to Mr. Leo. W. STACH and Dr. T. OINOMIKADO of Nippon Oil Mining Co., Tokyo, and Prof. K. ASANO of Tohoku University for their advice and revision, for which I herewith express my gratitude.

Family Anomalinidae

Subfamily Cibicidinae

Genus *Oinomikadoina*, n. gen.

Genotype;—*Oinomikadoina ogiensis* MATSUNAGA, n. sp., Funabashi sand, Haizume Formation, Upper Pliocene, Ogi, Nishigoshi-mura, Kariwa-gun, Niigata Prefecture, Japan.

Description;—Test plano-convex, trochoid; wall calcareous, perforate; aperture at inner margin of the base of the chamber as in *Cibicides*, but also an additional supplementary aperture, in the form of a small arch with a distinct lip, is developed on the periphery at the proximal end of the later chambers.

Remarks;—This new genus closely resembles *Cibicides*, but differs in the presence of the supplementary apertures on the outer periphery of the later chambers.

Occurrence;—Upper Pliocene to Lower Pleistocene, Japan.

Oinomikadoina ogiensis MATSUNAGA,
n. sp.

Text-figs. 1-3.

Description;—Test trochoid, flat or slightly concave on dorsal side, convex on ventral side, periphery of earlier chambers angled, but becoming rounded in later chambers; about 7 chambers in

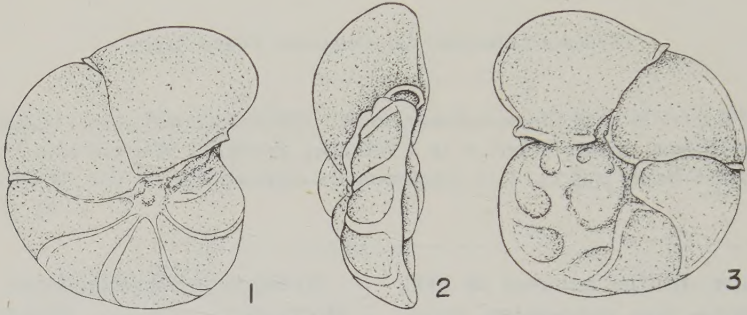
* Read Feb. 13, 1954; received Feb. 16, 1954.

1) Kariwa-gun, Niigata Prefecture, Japan.

2) Not yet published.

last whorl; sutures strongly limbate in early stage, depressed in later stage; wall coarsely perforate; aperture reniform, at base of apertural face, with a

(TOC. Pal. Cat. No. 601449) from the *Rotalia papillosa* Zonule of the Funabashi sand, Haizume Formation, Upper Pliocene, Ogi, Nishigoshi-mura, Kariwa-gun,



Text-figs. 1-3

Oinomikadoina ogiensis, n. gen., n. sp. $\times 50$

1, Ventral view; 2, Peripheral view; 3, Dorsal view.

distinct lip; supplementary aperture a small arch with a distinct lip, on the periphery at the proximal end of the last few chambers.

Dimensions;—Maximum diameter of holotype 0.62 mm., maximum thickness 0.24 mm. Other specimens range in diameter from 0.50 mm. to 1.07 mm.

Type Material;—Holotype (TOC. Pal. Cat. No. 601450) and unfigured paratype

Niigata Prefecture, Japan. Deposited in the Paleontological Laboratory, Teikoku (Imperial) Oil Co., Tokyo, Japan.

Occurrence;—This form has also been found from the Lower Pleistocene formation exposed along the sea cliff, about 750 m. east of Mabori, Ôtsu-machi, Yokosuka-shi, Kanagawa Prefecture, Japan.

252. FOSSIL SPECIES OF GENUS *MERCENARIA* FROM THE CENOZOIC DEPOSITS OF HOKKAIDO.*

ICHIRO HAYASAKA and SATORU UOZUMI

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北海道産 *Mercenaria* 属の化石：日本から報告された本属の 5 種の化石は、すべて北海道第三紀層中に見出される。これらの種を再検討し、十分な記載のなかつた *M. sigaramiensis* を再記載した。なお種間の関係および変異について考察した結果、近縁種 *M. y-iizukai*, *M. chitaniana*, *M. stimpsoni* は時代とともに、その殻高を減ずる傾向があることが認められた。

また形態に示される変異は、その種をとわず、殻幅において著しいことが注目される。

早坂一郎・魚住悟

The species of the genus *Mercenaria* hitherto known from the Cenozoic deposits in and around Japan, are very rare: they are the following five.

Mercenaria stimpsoni (GOULD)

M. chitaniana (YOKOYAMA)

M. yokoyamai (MAKIYAMA)

M. sigaramiensis (MAKIYAMA)

M. y-iizukai (KANEHARA)

Of these, *Mercenaria yokoyamai* has to be regarded as synonymous with *M. chitaniana* as will be discussed elsewhere, so that, in reality, there are only four species.

Among these species, some were repre-

sented by specimens under such unfavorable conditions that their minute characters have not been fully recognized: the taxonomic relations among them have not been well understood, consequently.

During the study on the Tertiary molluscs collected at various localities in Hokkaido by the members and students of our department and some other geologists, we could recognize that all the species, listed above, occur in Hokkaido. The geological ranges of these are tabulated below.

	Kw	Ow	Tk	Si	Recent
<i>M. stimpsoni</i>		—	—	—	—
<i>M. chitaniana</i>	—	—			
<i>M. y-iizukai</i>	—				
<i>M. sigaramiensis</i>	—				

Kw, Kawabata Series (Miocene); Ow, Oiwake Series (Upper Miocene or Pliocene); Tk, Takikawa Series (Pliocene); Si, Sishinai Series (Pleistocene).

* Read Feb. 13, 1954; received Apr. 16, 1954.

Based on the result of paleontological observations on these four forms, we try to discuss the relationship thought to exist among the three species, *M. y-iizukai*, *M. chitaniana* and *M. stimpsoni*, and to trace the trend of the variation in the form of shells of species belonging to the Genus *Mercenaria*.

The above mentioned three species are very close to one another in general aspects, but in regard to the proportion of Height/Length of shell, variation is rather conspicuous according to geological horizons: the older the geological age, the larger the value of Height/Length, and also the younger the bed, the longer the shell. *M. chitaniana* (Miocene~Pliocene) is intermediate in form as illustrated in the text-figure.

These relations seem to involve interesting phases of evolution or mutation. First of all, it appears that the height of shell has decreased in the course of geological time.

Secondly, the general trend of variation in the convexity of shells is noteworthy: in some specimens (Pl. 22, figs. 5 and 6, and KANEHARA's Pl. 25, figs. 1-4, 1927) the shell outline and the beak-distance do not vary, but are strongly convex and hunchback-like, with growth lines densely crowd near the ventral margin. Such a form shows that the growth was slow in height to the effect that the convexity rapidly increased. This is an abnormal form.

Such an abnormal form can be recognized in the specimens of the Genus *Mercenaria* without regard to species. Possibly this is a general trend of variation due to the adaptation to environment, the convexity being the predominating feature of the adaptive modification.

Concerning these facts exhibited by these four forms, we feel it necessary

to extend our studies both in the field and in the laboratory before we could draw any definite conclusion. However, it is suggested that the variation or development of the Genus *Mercenaria* took place along with the progress of the geological time, as is shown by the change of the ratio Height/Length of shell, and the variation of convexity which is regarded to be due to the change of environmental conditions.

Before going into the description of species, we wish to express our indebtedness to Mr. S. IGI, geologist of the Geological Survey of Japan, and to Mr. S. YOSHIDA, Hokkaido Gakugei University, for kindly submitting their specimens for study.

Systematic Descriptions

Family Veneridae

Genus *Mercenaria* SCHUMACHER, 1817

Mercenaria chitaniana (YOKOYAMA)

Plate 22, figs. 2a-b, 5a-b.

1923. *Venus stimpsoni* YOKOYAMA: *Japan. Jour. Geol. Geogr.* vol. 2, p. 6, pl. 1, fig. 5.
1926. *Chione chitaniana* YOKOYAMA: *Jour. Fac. Sci., Imp. Univ. Tokyo, sec. 2, vol. 1*, pt. 9, pp. 352-353, pl. 39, fig. 13.
1927. *Venus yokoyamai* MAKIYAMA: *Mem. Coll. Sci., Kyoto Imp. Univ. ser. B, vol. 3*, pp. 46-47, pl. 2, fig. 8.
- 1927.? *Chione chitaniana* YOKOYAMA: *Jour. Fac. Sci. Imp. Univ. Tokyo, sec. 2, vol. 2*, pt. 4, p. 201, pl. 51, figs. 3-4.
1931. *Mercenaria yokoyamai* KURODA: In HOMMA's *Shinano-Chyubu Chisitsusi* p. 58, pl. 6, fig. 39. (In Japanese).
1936. *Mercenaria yokoyamai* OTUKA: *Jour. Geol. Soc. Japan., vol. 43*, p. 724, pl. 13, figs. 1a-b.
1936. *Venus (Chione) yokoyamai* NOMURA and

- HATAI: *Saito Ho-on Kai Mus. Res. Bull.*, no. 10, p. 126, pl. 14, figs. 3-4.
1937. *Venus* (C.) *yokoyamai* NOMURA and HATAI: *Saito Ho-on Kai Mus. Res. Bull.*, no. 13, p. 134.
1938. *Venus* (M.) *yokoyamai* OINOMIKADO: *Jour. Geol. Soc. Japan.*, vol. 45, p. 672.
1939. *Venus* (C.) *yokoyamai* NOMURA and HATAI: *Japan. Jour. Geol. Geogr.*, vol. 16, no. 1-2, p. 5 and 55.
1940. *Mercenaria chitaniana* OTUKA: *Japan. Jour. Geol. Geogr.* vol. 17, nos. 1-2, pp. 95-96, pl. 11, figs. 9-12.
1940. *Mercenaria chitaniana* NOMURA: *Sci. Rep. Tohoku Imp. Univ.*, vol. 21, no. 1, pp. 260-261, pl. 33, fig. 17.

YOKOYAMA at first thought that the specimens found in Fujina beds (1923) were the same as the Recent species *M. stimpsoni*: afterwards, however, he gave the name *M. chitaniana* to a form from Horinouchi beds (1926). His original description is as follows:

"The shell is rather large, thick and moderately convex. It is ovately trigonal in outline, somewhat longer than high and very inequilateral, the anterior side being only about of one-half the posterior. The surface of all the specimens is much worn, but this much is certain, that it is radiately costulated, with costulae numerous, close, flattish, broader than interspaces and occasionally crossed by coarse lines of growth. The beaks are moderately swollen with the end pointed and curved in. A distinct lunula is present, cordate in outline and bounded by a sharp ridge on each side. Dentition unknown, so that the generic denomination remains to be confirmed."

This species is very closely allied, in the outline and the sculpture, to the Recent species, *M. stimpsoni* (GOULD), but it has a higher shell with a larger umbonal area, and a broader, cordiform lunule, than the latter.

M. yokoyamai, established by J. MAKIYAMA (1927), taking as type a specimen from the Dainichi beds, has been long accepted since, but as a result of our studies we believe it very possible that the two species, *M. chitaniana* and *yokoyamai*, are identical, the different appearance of the surface of the shell being due to the weathering of the former. Consequently, the specimens, hitherto called *M. yokoyamai* in various geological and paleontological publications, must be regarded as synonymous with *M. chitaniana*. Besides, the specimens YOKOYAMA referred to as *M. stimpsoni* from the Fujina beds, also are *M. chitaniana*.

The specimens from Hokkaido are strongly variable in form: especially, the range of variation in convexity and test-thickness is so great that sometimes it appears as if they were some other forms.

The specimens, figured here, Pl. 22, figs. 2a-b, represent very common forms, and the one, figured Pl. 22, figs. 5a-b is an extraordinary specimen which is strongly convex, and has a very thick test.

Dimensions:—(in mm)

length	Height	Thickness	
50.0	44.5	21.8	Left valve
60.7	54.0	?	Both valves
67.6	59.0	21.2	Right valve
75.4	64.7	53.0	Both valves
57.0	51.0	30.2	Both valves
53.1	46.7	33.6	Both valves

Occurrence:—The Sekitan-sawa, Atsunai, Otsu-mura, Tokachi Province; Honbetsu formation (Pliocene), U.H. Loc. Reg. No. 2001 (U.H.=Department of Geology and Mineralogy, Faculty of Science, Hokkaido University): the Bochinosa, Atsunai, Otsu-mura, Tokachi Province; Honbetsu formation (Pliocene), U.H. Loc. Reg. No.

2002: the upstream region of the Nishei-mappu-sawa, a branch of the Uryu-gawa, Ishikari Province; Poroshin formation (Miocene), U.H. Loc. Reg. No. 5014: the Okumigisawa, a branch of the Haboro-gawa, Tomamai-gun, Teshio Province; Chikubetsu formation (Miocene), U.H. Loc. Reg. No. 5016: at the junction of the Zunisen-sawa and the Haboro-gawa, Tomamai-gun, Teshio Province; Chikubetsu formation (Miocene), U.H. Loc. Reg. No. 5020: Oginai, Namewakka-mura, Hidaka Province; Noya formation (Miocene), U.H. Loc. Reg. No. 5015: the up-stream region of the Monbetsu-gawa, Hirotomi, Iburi Province; Kawabata formation (Miocene), U.H. Reg. No. 5018.

Repository:—U.H. Reg. No. 5858, 11304~11310.

Mercenaria y-iizukai (KANEHARA)

1937. *Venus (Chione) y-iizukai* KANEHARA: *Jour. Geol. Soc. Japan*, vol. 44, no. 45, pp. 794-795, pl. 25, figs. 3, 4.

KANEHARA's original description is as follows:

"Shell large, heavy, slightly longer than high, inequilateral, subtrigonal in outline. Beaks fairly prominent, strongly turned inward and forward, situated about one-fifth the length of shell from the anterior end. Posterior dorsal margin long and rather strongly convex in about a third of its length, beginning at umbone: nearly straight below this. Posterior end more acutely rounded than the anterior. Posterior-ventral margin gently rounded and passes into strongly arcuated anterior ventral margin. Antero-dorsal margin short, strongly excavated in front of beak. Umbone broadly rounded at its base. Surface

sculptured by numerous conspicuous concentric lines of growth and medium fine closely crowded radial ribs. Ventral margin crenated internally. Lunule well-defined, depressed, cordate, as long as high, extending two-thirds the length of antero-dorsal margin sculptured concentrically only. Escutcheon well-defined as long, narrow area which is depressed at more than right angle to main surface of shell: surface smooth except for fine concentric lines of growth. Hinge plate fairly heavy. Ligamental groove rather deep. On left valve, posterior cardinal somewhat elongated, situated on top of nymph plate: middle cardinal bifid and anterior high, bluntly pointed. Of the three cardinals of the right valve, anterior fairly thin, sharp and small; middle feebly bifid, posterior not elongated."

KANEHARA's type specimen shows very strong convexity, and have thick tests, but it seems to be a special form of this species, probably adapted to a special ecological condition.

The specimens, figured here, Pl. 22, figs. 3-4, are rather common forms and with less convexity and thinner test than the type specimen.

Dimensions:—(in mm)

Length	Height	Thickness	
57.0	53.0	13.5	Right valve
55.1	53.2	21.0	Left valve

Occurrence:—The upstream region of the Neseimappu-sawa, a branch of the Uryu-gawa, Ishikari Province; Poroshin formation (Miocene), U.H. Loc. Reg. No. 5014: the Tanno-sawa, a branch of the Abirashinai-gawa, Omagari, Teshio Province; Chikubetsu formation (Miocene); U.H. Loc. Reg. No. 5019.

Repository:—U.H. Reg. No. 11239 11311, 11318 (Type specimen preserved)

in the Geological Survey of Japan, was destroyed during the World War II, the specimen, U.H. Reg. No. 11311, is designated here as the Neotype.)

The Miocene and Pliocene species *M. chitaniana* is rather variable in the outline and sculpture: this is also true of the form found only in the Miocene, identified with *M. y-iizukai*. Certain paleontologists maintain that the two species are not distinguishable, because the wide ranges of form variation of the two overlap in certain features, and do not allow to draw a line of demarcation between them. On examining the specimens from Hokkaido, however, the writers believe that the two forms are generally distinct: *M. y-iizukai* has a higher shell, its anterior dorsal being very short, steeply sloping downward, and the anterior part is not produced. The writers feel that the present species has same relation to *M. chitaniana* as *M. chitaniana* has to *M. stimpsoni*.

According to KANEHARA's paper (1937), the type specimen came from the same horizon of the Chikubetsu formation (Miocene), and he maintains that the form from the Chikubetsu formation, *M. chitaniana*, previously mentioned by YOKOYAMA (1927), was this very species. But it is not known for certainty whether YOKOYAMA's specimen is really the same species or not, only from the judgement on the figures in the paper of YOKOYAMA: the two species, *M. chitaniana* and *M. y-iizukai* occurred together in this formation.

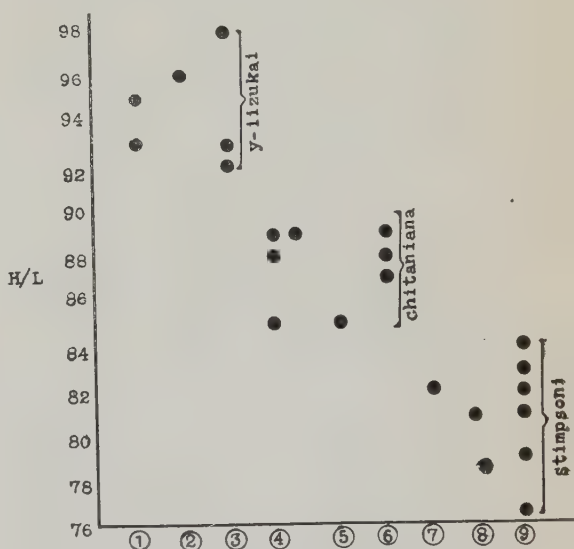
Mercenaria stimpsoni (GOULD)

1862. *Venus stimpsoni* GOULD: *Otica conchologica* p. 169.

1881. *Venus (Mercenaria) stimpsoni* BRAUNS, *Mem. Sci. Dept., Tokyo Daigaku*, no. 4, p. 40, pl. 5, fig. 21.

This species is common in the seas around Hokkaido, and it was recorded as fossil from the Furebetsu, the Teshio and the Okada formations in the Uryu coal field by M. YOKOYAMA (1931, 1932), and in the Takikawa formations by S. NOMURA (1935). But the exact horizons in which YOKOYAMA's and NOMURA's specimens occurred, are not certain.

It is quite likely that YOKOYAMA confused the Okada formation with the other formation: we doubt very much whether it really occurred in the Okada beds. On the other hand, the horizon which was considered by S. NOMURA as the horizon of this species is not the



Text-Fig. 1. Graph showing ratios of height to length in the three species, *M. stimpsoni*, *chitaniana* and *y-iizukai*.

- 1: Chikubetsu formation (Miocene)
- 2: Poroshin formation (Miocene)
- 3: Etaibetsu formation (Miocene)
- 4: Honbetsu formation (Pliocene)
- 5: Poroshin formation (Miocene)
- 6: Chikubetsu formation (Miocene)
- 7: Honbetsu formation (Pliocene)
- 8: Kaigarasawa formation (Pliocene)
- 9: Recent specimens of Hokkaido.

Takikawa formation but the Tôgeshita formation: Takikawa formation is not developed in that vicinity.

As far as is known, it is very improbable that this species extends down to the Kawabata series (Miocene).

The relations between the closely allied species, *M. chitaniana* and *M. y-izukai* are shown in the following graph.

Occurrence:—Shishinai, Tôbetsu-mura, Ishikari Province; the Shishinai formation (Pleistocene), U.H. Loc. No. 5017: the Sekitan-sawa, Atsunai, Otsu-mura, Tokachi Province; Honbetsu formation (Pliocene), U.H. Loc. No. 2001: The Kaigara-sawa, Otobe-mura, Nishi-gun, Oshima Province: Setana formation (Pliocene), U.H. Loc. No. 1001.

Repository:—U.H. Reg. No. 6354, 10253, 11314, 11315, 11316.

Mercenaria sigaramiensis (MAKIYAMA)

1927. *Venus sigaramiensis* MAKIYAMA: *Chikyû* (*The Globe*), vol. 8, p. 185, pl. 3, fig. 7 (in Japanese).

1931. *Mercenaria sigaramiensis* KURODA: In HOMMA's *Shinano-Chubu Chishitsushi*, pt. 4, p. 58, pl. 7, fig. 48.

No comprehensive description has been given of this species, although it was first introduced by J. MAKIYAMA (1927) as a new species "*Venus sigaramiensis*", the specimen having been an ill-preserved one. Subsequently it was transferred to the Genus *Mercenaria* by T. KURODA (1931).

The specimens determined to be this species, and figured on the plate came from the Poroshin formation in Central Hokkaido.

Hokkaido specimens are characterized as follows:

Shell rather large in size, fairly heavy and solid, transversely elliptical, and

somewhat variable in outline. Beaks strongly forward, prominent, curved in and touching: anterior dorsal very short, steeply sloped: anterior end slightly produced, smoothly rounded, passing to ventral margin without any angulation: posterior dorsal long, slightly convex and nearly horizontal, posterior end very broadly rounded. Lunule fairly large, strongly depressed, circular in form, sculptured by coarse crowded lamellae. Escutcheon well defined depressed at an angle a little more than at a right angle with the outer surface of the shell. Surface of the shell covered by the concentric lines that are a little broader than interspaces: they look more or less prominent in unweathered specimens.

Surface of weathered specimens radially sculptured: radial ribs fine and close: ventral margin internally crenulate: the radials are internal and are not shown on well-preserved specimens. Pallial sinus slightly ascending and pointed in front. Hinge unknown.

Dimensions:—(in mm.)

Length	Height	Thickness
63.3	61.3	39.0
71.1	51.0	54.5

Occurrence:—The upstream region of the Neseimappu-sawa, a branch of the Uryu-gawa, Ishikari Province; Poroshin formation. U.H. Loc. Reg. No. 5014.

Repository:—U.H. Reg. No. 11312, 11313.

This species is quite distinct from all the hitherto known Japanese species: in the outline it is characterized in being lower in proportion to length; in the circular form of the lunule: ligament being placed a little more posteriorly than in other forms in which it is almost behind the umbo.

This species is very variable in the

convexity of the valves: the specimens figured Pl. 22, figs. 1a-b are common, and the one figured Pl. 22, figs. 6a-b is an abnormal form having a great convexity.

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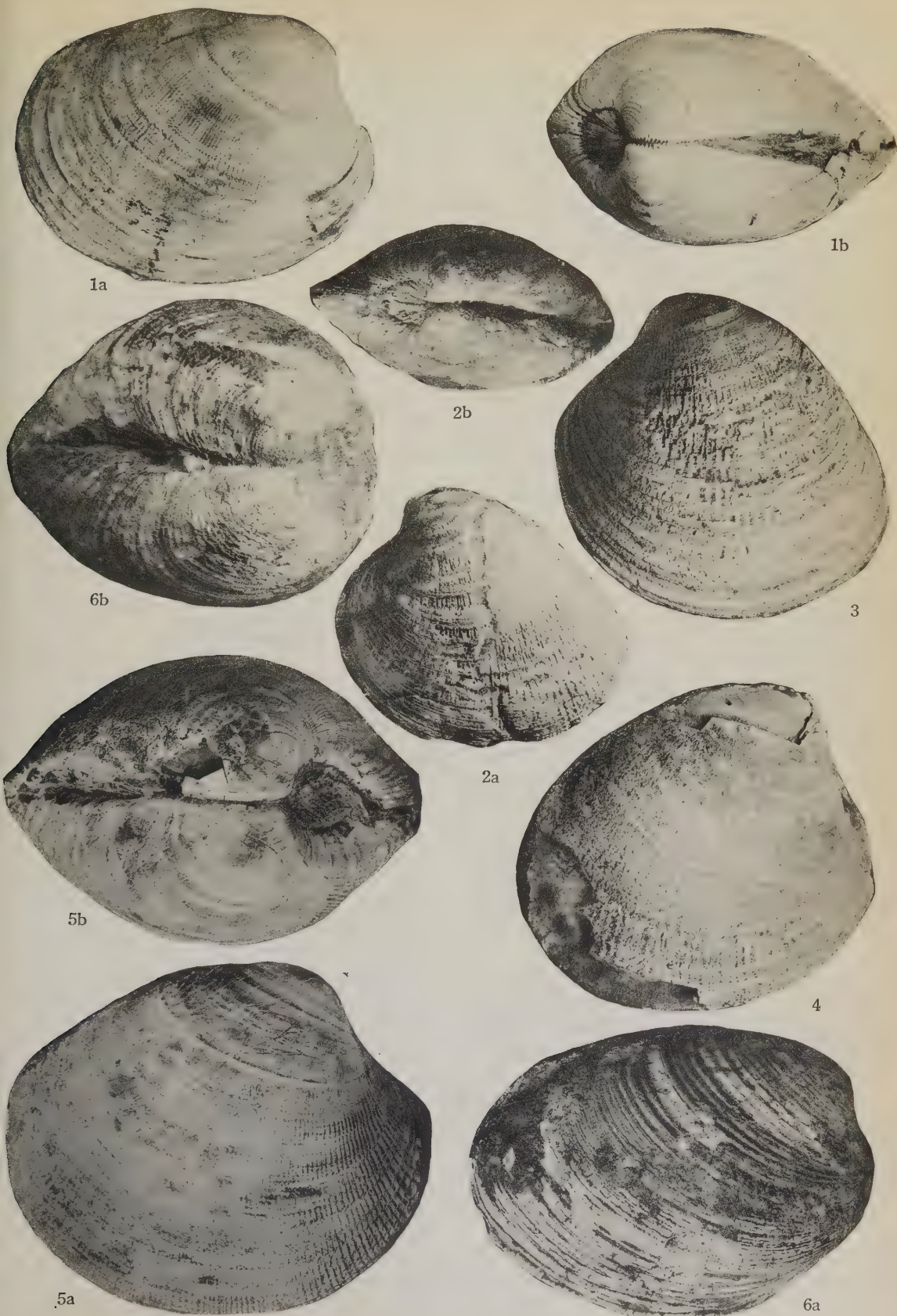
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Explanation of Plate 22

- Figs. 1a-b. *Mercenaria sigaramiensis* (MAKIYAMA): U.H. Reg. No. 11312 a, Side view of a right valve; b, dorsal view of same.
- Figs. 2a-b. *Mercenaria chitaniana* (YOKOYAMA): U.H. Reg. No. 11308. a, Side view of a left valve; b, dorsal view of same.
- Fig. 3. *Mercenaria y-iizukai* (KANEHARA): U.H. Reg. No. 11311. (Neotype).
- Fig. 4. *Mercenaria y-iizukai* (KANEHARA): U.H. Reg. No. 11239.
- Figs. 5a-b. *Mercenaria chitaniana* (YOKOYAMA) var.: U.H. Reg. No. 11305. a, Side view of a right valve; b, dorsal view of same. This specimen is an abnormal form of this species: it has a large convexity and very thick test.
- Figs. 6a-b. *Mercenaria sigaramiensis* (MAKIYAMA) var.: U.H. Reg. No. 11313. a, Side view of a right valve; b, dorsal view of same. This individual seems to be a special form of this species, probably adapted a special ecological condition.



253. *PATINOPECTEN KOBİYAMAI*, A NEW MIOCENE
SCALLOP FROM THE JOBAN COAL-FIELD, JAPAN.*

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常磐炭田産中新世帆立貝の新種 *Patinopecten kobyamai*: 福島県立平工業高等学校の小楡山元氏が常磐炭田内石森山北麓の石森貝層より採集した帆立貝化石を新種として記載した。又同地方高久村の中山層より産し本新種に同定し得る標本の観察から、本種が *Vertipecten* の持つ特徴をも兼ねそなえる点を指摘した。鎌田泰彦

Introduction

The new fossil scallop herein described was collected from a small cliff in the valley about 500 meters east of Nakayama, Ono-mura, Iwaki-gun, Fukushima Prefecture by Mr. Hajime KOBİYAMA, teacher at the Mining Department of the Taira Technical High School in Taira City, Fukushima Prefecture and by the writer. The shell bed which yielded the scallop is called by Mr. KOBİYAMA the Ishimori shell bed. This horizon is also exposed along the road-cut about 700 meters west of Mizujina, Kusano-mura, Iwaki-gun in the same Prefecture. At these two localities, the predominating rock consists of coarse-grained sandstone with intercalated fossil molluscs. The Ishimori shell beds are included in the Kabeya siltstone of Messrs. S. SATO and H. MATSUI (1951, p. 47) which occupies the stratigraphical

position shown in the annexed table. The writer wishes to add that the Kabeya formation is a correlative of the Honya formation of the Taira-Onahama area in this coal-field.

The shell bed of the Kabeya siltstone is well-developed in the northern part of the Ishimori area. Some molluscan fossils are found in this formation from a few places other than the above-cited two localities.

Acknowledgements

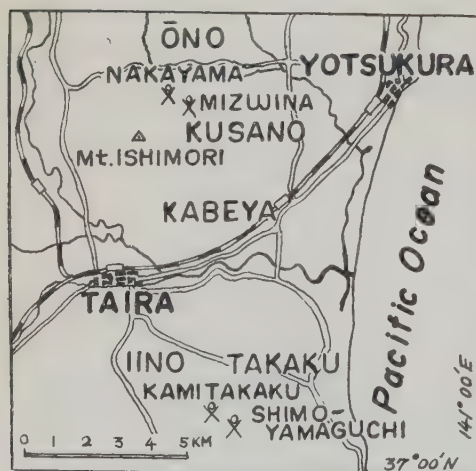
The writer is indebted to Mr. Hajime KOBİYAMA of the Mining Department of the Taira Technical High School, Taira City, Fukushima Prefecture, for his kind collaboration in the field and for his gift of his previous collection for study. The writer also appreciates the helpful suggestion of the following persons who read the manuscript, Professor Shoshiro

* Read Feb. 28, 1953; received July 19, 1954.

Stratigraphic Column in the Ishimori Area, Joban Coal-field

Thickness in meters	Group name	Formation name	Geological age
70+	Ōura	Yamadakominato siltstone Nagi sandstone	Miocene
unconformity			
260— 350	Kusano	Ōmori tuff Izumizaki conglomerate and agglomerate Kobana sandstone Kabeya siltstone Ishimori agglomerate	Miocene
190— 200	Yunagaya	Kameno-o shale Mizunoya siltstone and sandstone Goyasu sandstone	Miocene
unconformity			
170+	Shiramizu (= Uchigô)	Shirasaka siltstone Asagai sandstone Iwaki sandstone	Oligocene
fault			

(After S. SATO and H. MATSUI, 1951)



Map showing the fossil localities (x) in the Joban coal-field.

and Professor Kotora HATAI of the Department of Geology, Faculty of Education, Tohoku University, Sendai. The writer is indebted to Department of Education of the Japanese Government for the Grant in Aid for Fundamental Scientific Reserch which enables the present study.

Description of Species

Family Pectinidae

Genus *Patinopecten* DALL, 1898

Patinopecten DALL, 1898, *Trans. Wagner Free Inst. Sci. Philad.*, Vol. 3, p. 695.

Patinopecten kobyamai KAMADA, n. sp.

Plate 23, figures 1-4.

HANZAWA and Mr. Tamio KOTAKA of the Institute of Geology and Paleontology

Shell moderate in size, averaging about 85 mm in height in adult, rather higher than long, inequivalved, nearly equilateral, right valve somewhat ventricose, the left valve flat to slightly convex, margins smoothly rounded, sides only slightly concave above. Right valve with 5-6 strong, broadly rounded ribs, most elevated at its central part, where ribs are slightly wider than the interspaces, gradually broadening and becoming rather flat-topped ventrally. Of the radial ribs, posteriormost one low and narrow, sometimes splitting into several obsolete riblets; interspaces round-bottomed and sometimes provided with faint interstitial threads, whole surface of test marked with faint concentric growth lines. Hinge-line straight, slightly shorter than one-half of shell length. Anterior auricle slightly longer than posterior one, surface of both marked with fine growth lines and four or more radial riblets, byssal notch shallow but distinct; posterior auricle similar to anterior one, its extremity rectangular. Left valve with 6 rounded or roughly roof-shaped radial ribs, on the antero- and postero-dorsal margins, the ribs are weaker than the others which become well defined with sharp edges in the younger part of shell, while rounded near ventral margin. Interspaces between the ribs round-bottomed, wider than ribs and usually covered with microscopic cross-hatching network and with concentric growth lines more weakly developed than on right valve, moreover with weakly developed, rounded, closely spaced intercalary threads extending to as far as near central part of shell. Auricles similar to those of right valve, except for lacking byssal notch. Apical angle 90° .

Dimensions (in mm):—

	Height	Length	Depth	Hinge-length
Holotype	85	80	21	—
Paratype	89	78	27	—
„	—	79.5	20	—
„	85	83	23	—
„	85	83	—	36
„	65	62	20	—
„	52	50	12	—

Comparison:—This new species bears some resemblance to *Patinopecten kimurai* (YOKOYAMA)=*P. murayamai* (YOKOYAMA), *P. kimurai tiganouraensis* (NAKAMURA), *P. ugoensis* (HATAI and NISIYAMA) and *P. subyessoensis* (YOKOYAMA), but may be distinguished from them as to be mentioned below. This species may be distinguished from *P. kimurai* which ranges from the Honya formation of the Yunagaya group up to the lower part of the Taga group in the Joban coal-field by the different convexity of the right valve, more flattened left valve, less number of radial ribs and more weakly developed radial threads in the interspaces; from *P. kimurai tiganouraensis*, which is closely allied to the present species, from the Miocene of Shioyama, Miyagi Prefecture, by its smaller size and less degree of the apical angle; from *P. ugoensis* by having threads in the interspaces, by the asymmetrical convexity of the valves, having microscopic cross-hatched ornamentation on the left valve, and less number of radial ribs; from *P. subyessoensis* from the Miocene of South Saghalin, by its smaller size, less number of ribs and by the presence of threads in the interspaces.

Remarks:—A well-preserved specimen which was collected by Mr. H. KOBİYAMA from the Nakayama formation of Shioyama, Takaku-mura, Iwaki-gun, Fukushima Prefecture and shown in figures 3a and 3b in Plate 23, may be

referred to the present new species, although it is smaller in size and of less convexity. The surface of the younger part of the left valve less than 30 mm in size is covered with minute cross-hatching network, while the older part of the valve is marked with minor radial threads not only on the ribs but also in the interspaces between the ribs, their number amounting to 90 on the whole valve. The radial threads consist of an imbrication of minute scales. The last-cited characteristics of the radial threads have not been noticed in any other known species of *Patinopecten*. These features of the radial threads are not observed distinctly on the specimens from Ishimori. GRANT and GALE (1931, p. 188) established a new genus *Vertipecten* by designating *Pecten nevadanus* CONRAD as the genotype. They distinguished the new genus from the genus *Pecten* by the characteristic features of the radial threads with imbricated scales as is seen on *Pecten nevadanus* CONRAD. In that occasion, they held the view that *Vertipecten* is in a close relationship with *Patinopecten* and that "it may be found more convenient to consider *Vertipecten* merely as the ancestral section of *Patinopecten*." The present new species is convex in the right valve and is much flattened in the left, while the reverse is the general case in *Vertipecten*. But the present new species seems to possess the characters of both *Patinopecten* and *Vertipecten* and to occupy an intermediate position between them. It may be possible to consider that the present form is a link connecting the two genera just quoted, however, the material at hand seems to be premature for conclusive remarks.

Since the characters of the present new species may neither be assigned to *Patinopecten* nor *Vertipecten* in strict

sense and since the specimens may be referred to no known genus, it seems worthy to establish a new subgeneric or generic name for it. However, owing to that sufficient specimens are required to study the interior features and the stability of its surface characters, the writer withholds erecting a new generic name until such an opportunity arrives.

The specific name of this new species is dedicated to Mr. Hajime KOBAYAMA, who kindly directed the writer to the fossil locality and who offered his specimens for study. It may also be added that his father the late Nobuo KOBAYAMA was also interested in collecting fossils and he also collected this new scallop from the Ishimori shell-bed in May of 1932, which is now in the Saito Ho-on Kai Museum, Sendai, Japan (SHM coll. cat. no. 2305).

Localities and horizons:—

IGPS* loc. no. Fs-23; About 500 m east of Nakayama, Ono-mura, Iwaki-gun, Fukushima Prefecture. (Taira). Lat. 37° 06' 16" N., Long. 140° 54' 51" E. Type locality. Miocene Kabeya formation. IGPS coll. cat. no. 72963. H. KOBAYAMA and Y. KAMADA coll.

IGPS loc. no. Fs-37; Shimo-Yamaguchi, Takaku-mura, Iwaki-gun, Fukushima Prefecture. (Taira). Lat. 37°00' 42" N., Long. 140°55' 27" E. Miocene Nakayama formation. IGPS coll. cat. no. 72964. H. KOBAYAMA coll.

IGPS loc. no. Fs-36; Kamōri-saku, Kami-takaku, Iino-mura, Iwaki-gun, Fukushima Prefecture. (Taira). Lat. 37°00' 12" N., Long. 140°55' 49" E. Miocene Nakayama formation. IGPS coll. cat. no. 72965. Y. KAMADA coll.

*Distribution of similar species:—*The following distribution is that of specimens closely resembling the present new species but are not identical.

* IGPS, abbreviation for Institute of Geology and Paleontology, Sendai, Japan.

1) West coast of Motoura River, Nishi-Anecha, Hagifuse-mura, Uraga-gun, Hidaka Province, Hokkaidô. IGPS coll. cat. no. 50972. K. IGARASHI coll.

2) Shimo-Myôga, Miyakawa-mura, Kuji-gun, Ibaragi Prefecture. IGPS coll. cat. no. 28444. T. IZUMITANI coll.

3) Soeguni, Nishiumi-mura, Suzu-gun, Ishikawa Prefecture. IGPS coll. cat. no. 61482. MATSUSHIMA coll.

4) Fujitoge, Tabanematsu-mura, Kanuma-gun, Fukushima Prefecture. Dept. Geol. Coll. Educ. Tôhoku Univ. Reg. no. 325. K. HONDA coll.

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Explanation of Plate 23

Patinopecten kobyamai KAMADA, n. sp.

Fig. 1a-c. Holotype. Loc. About 500 m. east of Nakayama, Ono-mura, Iwaki-gun, Fukushima Prefecture. Kabeya formation; Miocene.

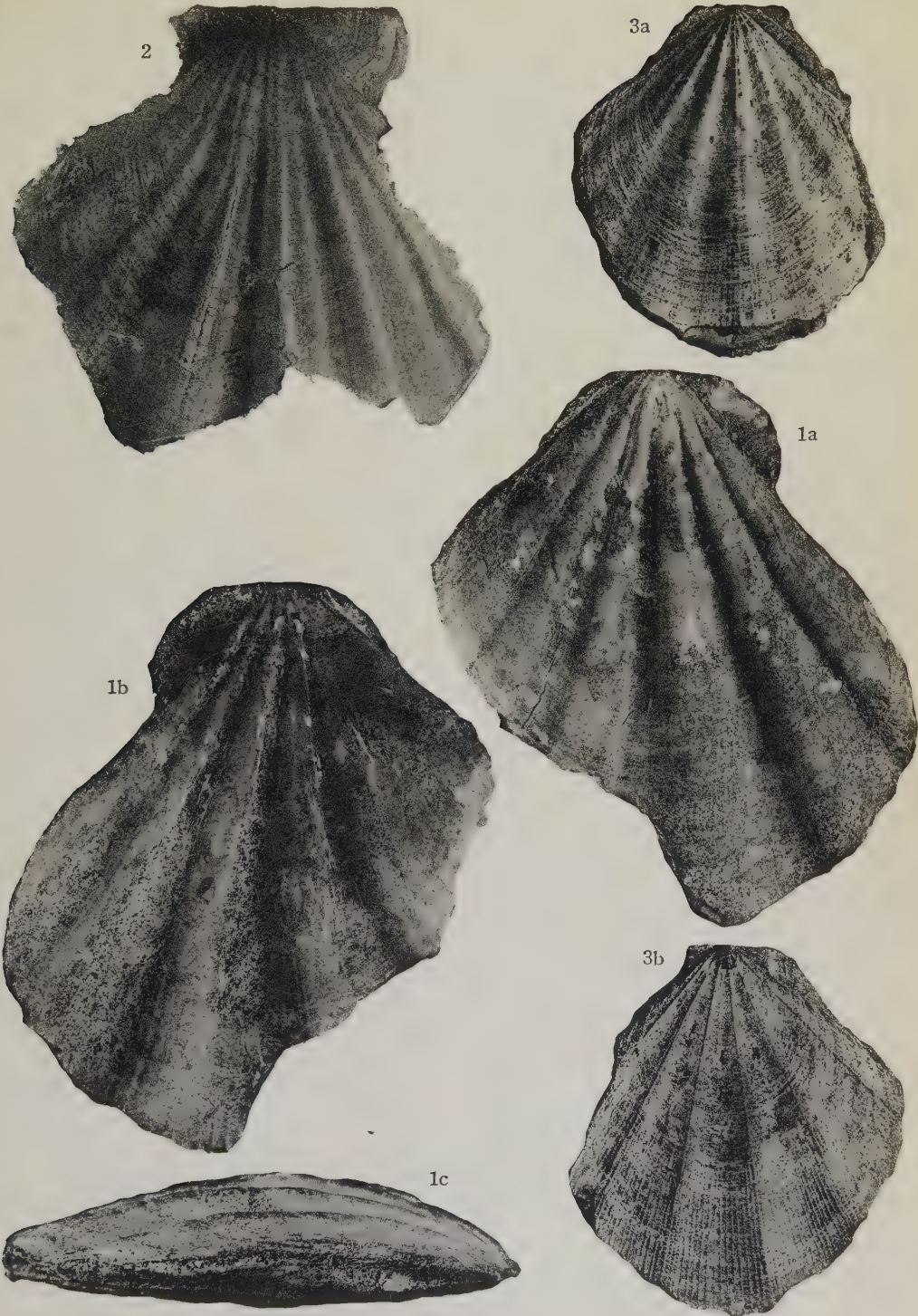
- a. Exterior of right valve.
- b. Exterior of left valve.
- c. Profile of both valves, anterior view.

Fig. 2. Referred specimen. Loc. Kamôri-saku, Kamitakaku, Iino-mura, Iwaki-gun, Fukushima Prefecture. Nakayama formation, Miocene. Plastotype of exterior of right valve.

Fig. 3a-b. Referred specimen. Loc. Shimo-Yamaguchi, Takaku-mura, Iwaki-gun, Fukushima Prefecture. Nakayama formation, Miocene.

- a. Exterior of right valve.
- b. Exterior of left valve.

(All figures in natural size)



254. A GIGANTIC FUSULINID SPECIES FROM THE KITAKAMI MASSIF, NORTHEASTERN JAPAN.*

RYUZO TORIYAMA

Department of Geology, Kyushu University, Fukuoka

北上山地産巨脉紡錘虫: 東北日本北上山地産巨脉紡錘虫 *Lepidolina? gigantea* n. sp. を記載した。
鳥山隆三

The purpose of this paper is to describe a gigantic species of fusulinid foraminifer found by Professor MINATO of Hokkaido University in the Permian exposed in the southern part of the Kitakami massif, Northeastern Japan.

All the materials available to me are so poorly preserved that they are not adequate for detailed precise micropaleontological study. Nevertheless the fact, I (1952) described twenty four species of eleven genera because the Permian rocks of the Kitakami massif are very important, being regarded as the standard of the Upper Paleozoic of this country.

Through his study on the Usuginu conglomerate, clarified MINATO (1944) the geohistorical condition of the area in the Late Permian time. According to him the sedimentary basin of this area was gradually changed from an open sea condition in the Kanokura epoch to an inland-sea condition in the Toyoma epoch. It is natural to consider that such a condition that muddy facies were increasing might have been unfavourable to fusulinid foraminifers. It is, there-

fore, not probable to take an assumption that the occurrence of this unusual species might be imputable to the special condition of the environment.

On the other hand, it is generally recognized that the developing of large shell was the positive direction of the progressive evolutionary trend in fusulinid shell, and that the latest representatives of *Neoschwagerininae* and *Fusulininae* had very thin and almost structureless single layer of spirotheca. Therefore, it is beyond doubt that this unusual large species was in the latest stage of phylogeny; and it is most probable to assume that the occurrence of *Lepidolina? gigantea* n. sp. is one example of orthogenetic development or program evolution, namely, this species had attained the unusual size of shell regardless of the environment which was gradually changing to rather unfavourable condition for fusulinid foraminifers.

I wish to express my most sincere gratitude to Professor M. MINATO of Hokkaido University for the opportunity to study his collections, and to Professor M. L. THOMPSON of University of Wisconsin for critical reading of the manuscript.

* Read Oct. 9, 1954; received July 19, 1954

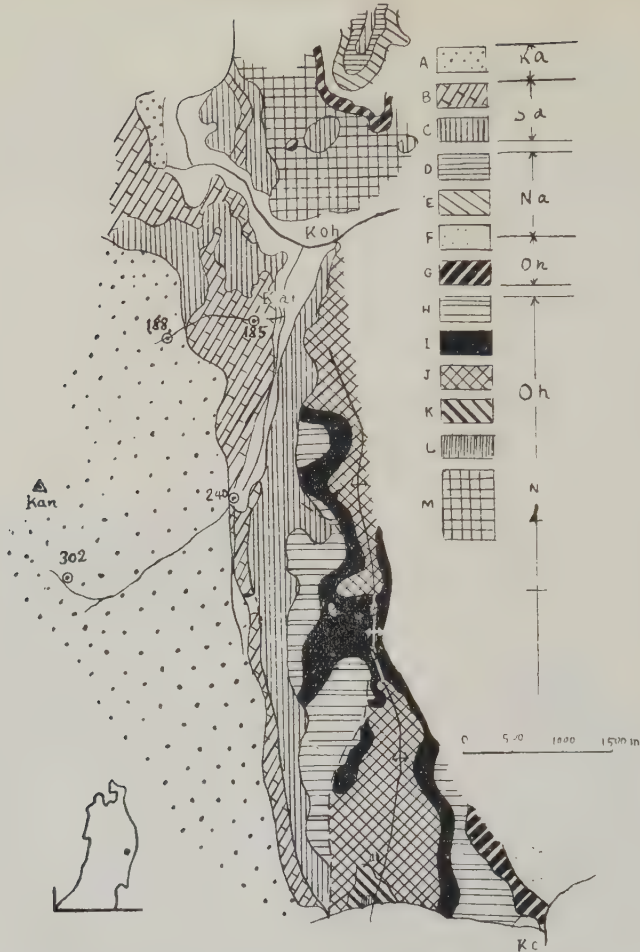


Fig. 1—Geological Map of the environ of Katchizawa, Setamai-mura, Kesen-gun, Iwate Prefecture, Northeastern Japan. (After M. MINATO, 1942)

- | | | |
|---|----|--|
| A. Clayslate and Limestone | Ka | Kanokura Series (containing <i>Yabeina</i> -Limestone) |
| B. <i>Pseudoschwagerina</i> -Limestone | } | Sa.....Sakamotozawa Series |
| C. Shale bed, conglomerate in the lowest part | | |
| D. Sandstone bed | } | NaNagaiwa Series |
| E. <i>Chaetetes</i> -Limestone (<i>Fusulinella</i> -limestone) | | |
| F. Sandstone bed | | |
| G. Coral-Limestone | On | Onimaru Series |
| H. Sandstone bed | } | OhOhdaira Series |
| I. Schalstein bed | | |
| J. Clayslate bed | | |
| K. Schalstein bed | | |
| L. Clayslate bed | | |
| M. Unclassified bed | | |

Koh, Kofugane; Kat, Katchizawa; Ko, Kotsubo; Kan, Kanokura-yama

Lepidolina? gigantea TORIYAMA,
new species

Pl. 24

Description:—This species has a much larger size and more numerous volutions than any known species of neoschwagerinids. The volutions number 24 or more, attaining at least a length of 21mm and a width of 15 mm. The volume of the shell is estimated to have been more than 5,000 cubic millimeters.

The external form of the shell is not exactly known for parts of all available specimens are missing. The specimen here illustrated, and the most nearly complete available, is diagonally cut.

The proloculus seems to be rather large in size, though its diameter cannot be measured accurately. The volutions expand rapidly and almost uniformly.

The spirotheca seems to consist of only a single homogeneous layer, but in some portions of the outer volutions a very thin but opaque layer can be seen. In spite of the careful observation under

high magnification of the microscope, I have found no alveolar structure either in the spirotheca or in the septa and septula.

Characteristics of the septal structure are not clearly known, as there is no exactly oriented section available. Under the microscope, the illustrated specimen shows two sets of septula. They obviously are the downward deflection of the lower part of the spirotheca. In the inner volutions of the shell, both septa and septula are difficult to observe. In the outer volutions four or more, and even as many as seven, axial septula are intercalated between adjacent septa. All of the septula are not pendant-shaped in cross section and equal in length as in *Sumatrina* or *Afghanella*. In the outer volutions, especially in the last one or two volutions where the state of the preservation seems to be best, septula are so short that they look a coarse keriotheca.

The following measurements in millimeters are of the illustrated specimen:

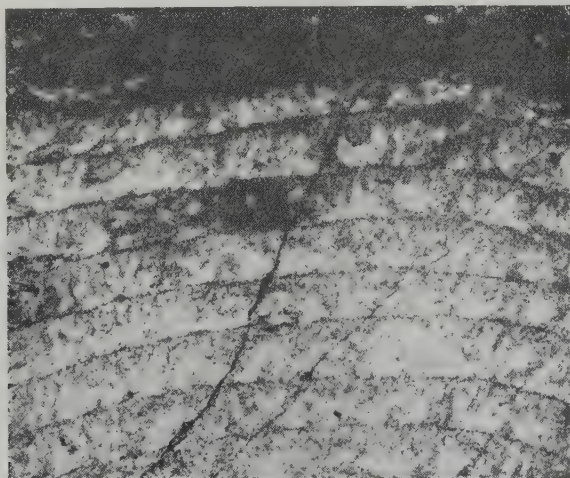


Fig. 2. A part of outer volutions, showing spirotheca and septula. $\times 20$.

Volution	Half Diameter	Volution	Half Diameter
0	?	13	3.76
1	0.35	14	4.21
2	0.72	15	4.54
3	1.07	16	4.87
4	1.33	17	5.17
5	1.70	18	5.54
6	1.96	19	5.79
7	2.21	20	6.13
8	2.44	21	6.49
9	2.77	22	6.83
10	3.02	23	7.12
11	3.28	24	7.53
12	3.54		

Remarks.—I am uncertain as to what genus in the subfamily *Neoschwagerininae* the present species belongs. Furthermore, I have never before seen such a large neoschwagerininid. It is unfortunate that I have been able to secure neither an exactly oriented axial nor an oriented sagittal section from the material at my disposal. It seems most probable that the present species is referable to the genus *Lepidolina* LEE.

There is no species in the subfamily *Neoschwagerininae* which can be compared with this species in its numerous volutions, rapid expansion of shell, and the characters of septa and septula.

Locality and Horizon.—*Lepidolina? gigantea*, n. sp. was found at Kanokura-zawa, Setamai, Kesen-gun, Iwate Prefecture, associated with *Pseudofusulina japonica* (GÜMBEL) and *Lepidolina? spp.*

B and C.

The illustrated specimen will be deposited in the paleontological collection of Department of Geology and Mineralogy, Hokkaido University, Japan (No. 185-3).

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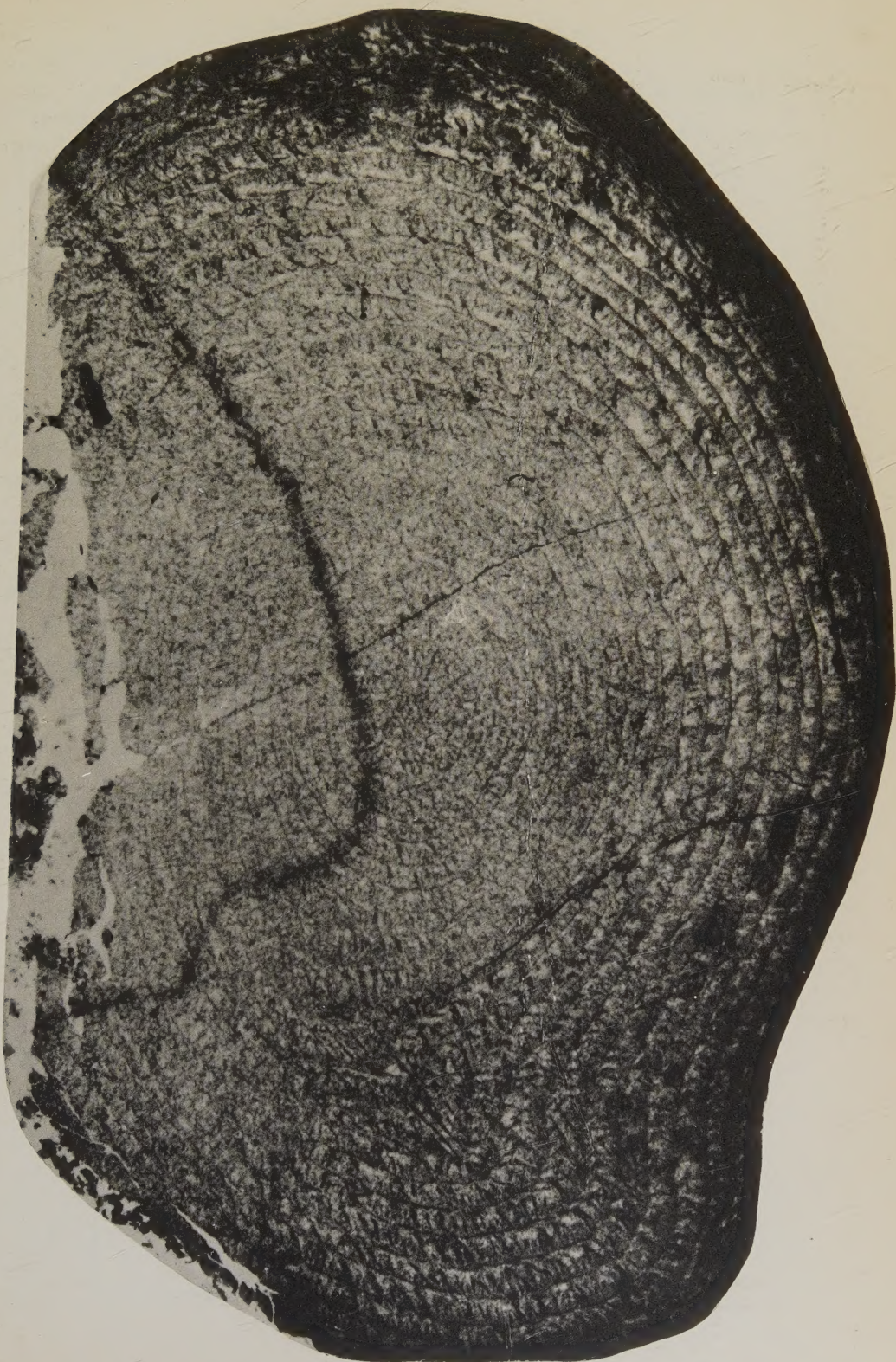
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[Postscript]:

The manuscript of this paper was completed in 1951 while I was in Madison, Wisconsin, and I had expected that it would be published before my paper of 1952 was published. It is my regret that this paper has not been published until today.

Explanation of Plate 24

Lepidolina? gigantea TORIYAMA, n. sp. Diagonal section (185-3), $\times 10$.
Collected from Kanokura-zawa, Setamai, Kesen-gun, Iwate Prefecture.



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第 60 回 例 会	福 岡	2 月 12 日	1 月 15 日

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